2004-2005 REPORT TO CONGRESS

RESEARCH LEARNING CENTERS
GREAT LAKES RESEARCH AND EDUCATION CENTER

December 15, 2005

Contents

SUMMARY

The Great Lakes Research and Education Center was established in 2002 as part of the Natural Resource Challenge mandate. Its goals are 1) to facilitate research in 10 Great Lakes National Parks; 2) to provide park science research and education opportunities to the public; and 3) to convey applied natural and cultural resources research to the network parks through education and outreach.

During Fiscal Year 2004-2005 the Great Lakes Research and Education Center made considerable progress in development of research and education programs. Activities included completion of the Field Research Station, provision of laboratory equipment, development of the educational resource center, and increasing partnerships to enhance research and engage the public in park science. Both multi-park and individual park research projects were enhanced directly through GLREC staff support, such as grant writing, funding procurement, and technical support. Research results were communicated to managers and the public through education workshops, citizen science training, local and national publications, and park presentations. The GLREC staff co-authored or provided financial support for eight professional research publications. Staff also produced several newspaper articles, brochures, local publications, and electronic communications to the public on Great Lakes national parks research and management programs.

During the 2004-2005 fiscal period, program implementation proceeded primarily with Research Learning Center base funding. Research projects funded through NPS and USGS grants provided support for multi-park research from which informal education programs were developed. Future planning will include expanding research at the GLREC Field Research Station, developing partnerships for funding support, developing scientific consortia with universities and other government agencies to enhance research opportunities and information sharing, continue citizen science training programs, developing training opportunities for park staff, and expanding data and information transfer among the network parks and other Natural Resource Challenge programs.

I. GENERAL DESCRIPTION

Mission and Overview

The goals of the GLREC are 1) to facilitate research in 10 national parks and adjacent waters in the Great Lakes Region; 2) to provide park science research and education opportunities to the public; and 3) to convey applied natural and cultural resources research to the network parks through education and outreach.

- Establishment

The Great Lakes Research and Education Center (GLREC) was established and funded in 2002 to facilitate research in 10 national parks and monuments in the Great Lakes Region with Natural Resource Challenge funding of $225,000 (Table 1).

- Parks Served in the Network

The GLREC is hosted by Indiana Dunes National Lakeshore (INDU) located at the southern tip of Lake Michigan. The network parks include Apostle Islands National Lakeshore (APIS), Grand Portage National Historic Monument (GRPO), INDU, Isle Royale National Park (ISRO), Keweenaw National Historic Park (KEWE), Mississippi National River and Recreation Area (MISS), Pictured Rocks National Lakeshore (PIRO), St. Croix National Scenic Riverway (SACN), Sleeping Bear Dunes National Lakeshore (SLBE), and Voyageurs National Park (VOYA) (Table 2).

Facilities

The facilities consist of two renovated historic buildings at INDU. Base funding from the 2002 and 2003 Resource Challenge and INDU maintenance budget was used for renovations. Restoration of a 1941 home was completed in August of 2003 and provides space for GLREC offices and an educational resource center. Renovation of a 1908 Sears catalog house for laboratory and office use by visiting researchers was completed in August 2005 (Fig. 1a). No other partners provided operational support in 2004. Laboratory equipment is currently being requisitioned and projected to be available to researchers in winter 2005. The newly renovated GLREC Research Field Station has been equipped with a wet lab, drying oven, incubators, laminar flow hood, growth chamber, microscopes and other materials for research and training purposes (Fig. 1b). INDU's Divisions of Maintenance and Resource Management provide operational support.

GLREC Staff

Center staff consists of a Research Coordinator and an Education Coordinator. The Research Coordinator, Dr. Joy E. Marburger, and the Education Coordinator, Wendy W. Smith, assumed duties in 2002. The Research Coordinator assists researchers in grant writing for internal and external funding sources, provides technical support, manages park documentation requirements and permits, and manages the housing and the Field Research Station for researchers to use. The Research Coordinator oversees single and multi-park research projects within the network. The Research Coordinator also facilitates communication among researchers and resource managers through technical publications, conferences, and training. The Education Coordinator provides educational workshops with a research component. The Education Coordinator provides information to each of the network parks on current natural resource research topics, manages the educational resources, and facilitates several educational and interpretive programs. The Education Coordinator also develops educational materials, such as brochures and research communication for public outreach and education. Other activities that both coordinators conduct include educational demonstrations, multi-agency workshops, conferences, and citizen science programs.

Table 1. 2004-2005 Funding Sources for the GLREC

Type (internal or external)	Source Name	Direct Funds ($1000)	In-kind		% Dispersal (total to 100%)					
			Value ($1000)	Item(s)	Staff	Research (grants, contracts)	Infrastructure Equipment & Serving Research (Lab, housing)	Education Outreach, Materials and Equipment	Maintenance	Other
Internal	Challenge	225,000			155,600 (69)	3,200 (1.4)	29,000 (13)	4,600 (2.0)	11,050 (5)	1,500 (0.6)
Internal	Challenge			PIRO housing			20,000 (9)			
Internal	Challenge/CCI		1,000	Pitcher Plant research		8,130				
External	Challenge/POBS		2,000	Cattail research		32,300				
Internal	State Coordinator Funds		1,390	Science education kits						
External	Indiana Dunes Environmental Learning Center		630	Intern time and facility use						
External	Volunteers		1,193	Citizen science surveys						

Figure 1a. Great Lakes Research and Education Center Field Research Station (FRS).

Figure 1b. The FRS includes a wet laboratory, training room, conference center, and four offices to accommodate researchers and students.

Table 2. Center Identification and Network Parks

Center Name	Host Park and Network Parks	Initial/Main Funding Source
Great Lakes Research and Education Center (2002)	**Indiana Dunes National Lakeshore** (IN) Apostle Islands National Lakeshore (WI) Grand Portage Nat'l. Historic Monument (MN) Indiana Dunes National Lakeshore (IN) Isle Royale National Park (MI) Keweenaw National Historic Park (MI) Mississippi Nat'l. River and Rec. Area (MN) Pictured Rocks National Lakeshore (MI) St. Croix National Scenic Riverway (WI) Sleeping Bear Dunes National Lakeshore (MI) Voyageurs National Park (MN)	Natural Resource Challenge

Partnerships with other Natural Resource Challenge Programs

Examples of partnerships with other Natural Resource Challenge Programs to improve efficiency and effectiveness:

- Developed and facilitated multi-park, international research project using current technologies through partnership with the CESU universities (Michigan Technological University)
- Developed and implemented one regional multi-park research and one international research project through partnership with national USGS research scientists (National Wetlands Research Center)
- Co-facilitated Western Great Lakes Research Conference with Great Lakes Inventory and Monitoring Network, Great Lakes – Northern Forest CESU, and Pictured Rocks National Lakeshore
- Developed two workshops on Garlic Mustard and Cooperative Weed Management Areas in collaboration with the US Forest Service, Sleeping Bear Dunes National Lakeshore, and the Great Lakes Exotic Plant Management Team.
- Participated in an international slime mold inventory that was facilitated by Appalachian Highlands RLC through a National Science Foundation Grant to the University of Arkansas
- Provided posters and brochures to publicize Natural Resource Challenge Programs
- Wrote PMIS grant proposals with Great Lakes park resource managers, USGS, and RLC collaborators:
    1. Research coordinator wrote and submitted three PMIS grant proposals with a) University of Wisconsin and Voyageurs National Park collaborators for cattail ecologic investigations; b) Purdue University researcher, SLBE, PIRO, INDU, and Inventory and Monitoring coordinator on contaminant effects on fish; and c) GIS training workshop in collaboration with USGS National Wetland Research Center
    2. Education coordinator co-authored a PMIS proposal (along with Appalachian Highlands RLC and Point Reyes RLC) to fund an Interpretive Development Program aimed at increasing collaboration.
- Research coordinator provided assistance to regional staff in review and prioritization of NRPP PMIS proposals, edited abstracts for the Western Great Lakes Research Conference, and created cover for abstract booklet.

Housing for Researchers

Two park houses are available at INDU. These provide lodging for six researchers at a nominal cost of $8.53 per day per room for one house, and $ 9.78 for the second house (Table 3). During field season other programs also use the housing, such as staff from the Inventory and Monitoring Program and the Exotic Plant ManagementTeam, and seasonal staff for INDU resource managers. The Purdue University Field Station, a park building leased by Purdue University North Central (a GLREC partner), also provides lodging for up to 10 researchers.

Table 3. Housing for Researchers

Type of Housing	$ / Night @ # Nights	Total Cost	Equivalent Private Lodging	$ / Night @ # Nights	Total Private Value	Savings to Researchers
House1	8.50 @ 220	1,870.00	Rental House	20.00 @ 220	4,400.00	2,530.00
House2	9.80 @ 6	58.80	B&B	75 @ 6	450.00	391.20
Network Park Cabin (VOYA)	13.00@4	52.00	Hotel	55@4	220.00	168.00
Restored house (SLBE)		20,000.00			60,000.00	

Value of Housing to Researchers and Partners

- Jennifer Karberg, Michigan Technological University Ph.D. student:
  "Housing was very comfortable and convenient to the study site".
- Steve Travis, USGS researcher:

"Having the park housing available saved some money to apply to the grant budget for the actual research costs and it was convenient to the study site at VOYA".

- Steve Yancho, Chief of Resource Management at Sleeping Bear Dunes National Lakeshore:

"The GLREC provided assistance for researcher housing opportunities at SLBE through a $20,000 grant towards the restoration of a building to be used for such purposes."

GLREC Involvement with Student Research

Table 4 shows the type of research and educational level for research conducted at INDU. The research coordinator has direct or indirect interaction with graduate or postdoctoral students through active management of the research and collection permits and through provision of housing.

Table 4. Students Conducting Research with GLREC Involvement

Degree Sought	No. of Students	Research Field	Research Topic	Types of Projects
Post-doctoral training	2	soil microbiology	soil organisms	post-doctoral research
	1	botany	air contaminants effects on plants	post-doctoral research
	1	botany	invasive plant genetics	post-doctoral research
Ph.D.	1	geology	sand formation	Ph.D. dissertation
	1	botany	wetland plant genetics	Ph.D. dissertation
M.S.	1	botany	biodiversity of slime molds	M.S. thesis
	1	zoology	rare, endangered mammals	M.S. thesis
	1	botany	air contaminant effects on wetland plants	M.S. thesis

II. ACCOMPLISHMENTS

Government Performance Results Act (GPRA): Goals Achieved

The achieved GPRA goals and the percent time appropriated to the goals include:
Goal Ia1A- Disturbed Lands, 5%
Goal Ia1B- Invasive (non-native) Plants, 10%
Goal Ia01B- Invasive (native) Plants, 10%
Goal Ia1C- Land Health: Wetland Areas, 20%
Goal Ia1E- Land Health: Upland Areas, 5%
Goal IIa1A- Visitor Satisfaction, 25%
Goal IVb1a- Park Partnerships, 25%
There is overlap in some of the goals, such as GLREC development and implementation of public workshops on wetland restoration and protection (Goals Ia1C, IIa1A, and IVb1A).

Non-NPS Partners

GLREC staff assisted other programs, including research and education facilitation. Table 5 shows non-NPS partners involved in various research and education projects, and whether they were established through formal or informal agreements.

Table 5. Non-NPS Partners

Name of partner	Level (national, regional, state, local)	Primary Focus (research, education, restoration of historic structures, etc.)	Type (Formal or Informal)
USGS National Wetlands Res. Center	National, Regional	Research	Formal
USGS Lake Michigan Ecological Research Station	Regional	Research	Formal
Chicago Wilderness	Regional	Research, Education	Informal
Northwestern Indiana Regional Planning Commission	Regional	Education	Informal
Alliance for the Great Lakes	Regional	Education	Informal
USDA Forest Service	Regional	Research, Education	Informal
Midwest Invasive Plant Network	Regional	Research, Education	Informal
Isle Royale Institute	Regional	Research, Education	Informal
Shedd Aquarium	Regional	Research, Education	Formal
Loyola University	Regional	Research	Formal
DePaul University	Regional	Education	Informal
Roosevelt University	Regional	Education	Informal
Indiana Department of Natural Resources	State	Education	Informal
Indiana Dunes Environmental Learning Center	State	Education	Informal
Save the Dunes Conservation Fund	Local	Education	Informal
Friends of the Dunes	Local	Education	Informal
Lake County Solid Waste Management District	Local	Education	Formal
Northwest Indiana Invasive Plant Network	Local	Education	Informal
Environmental Educator's Network of the Southern Lake Michigan Region	Local	Education	Informal

III. RESEARCH

Permits Processed

The GLREC research coordinator manages the RPRS permits for INDU and contacts network parks about permit issues for multi-park projects. Permits processed at INDU are shown in Appendix 1. The research coordinator discusses applicability of the research to parks needs and requests individual park and multi-park research activities to have an educational component. The Research Coordinator held meetings or conference calls with nine researchers to discuss potential new research projects and proposals, either at INDU or at several network parks.

The Research Coordinator processed 44 research, monitoring (survey), and collection permits for INDU from October 1, 2004 to September 30, 2005. The permit projects include:

- 30 research permits
- 10 monitoring, survey permits
- 4 collection permits

Total = 44 Permits

No.	Type of Research
10	animal ecology (bats, birds, reptiles, amphibians, insects)
5	plant ecology, demography, fire ecology
2	plant population and molecular genetics
3	lower plants, animals (algae, fungi, eumycetes, protists)
2	contaminants in water and sediment
2	air quality - contaminants in plants
2	geology, paleoecology
1	water quality
1	exotic insects
1	animal molecular genetics
1	exotic plants

Researchers from the following 21 organizations obtained RPRS permits for work conducted at INDU:
Bethel College (IN), Chicago Botanic Garden, Chicago Field Museum, Florida International University, Indiana University Bloomington, Indiana University Northwest, Indiana Univ/Purdue Univ-Indianapolis, Loyola University Chicago, Michigan Technological University, Morton Arboretum, Northern Illinois University, Purdue University-Calumet, Purdue University-Lafayette, Purdue University-North Central, Save the Dunes Conservation Fund, The Nature Conservancy, University of Wisconsin Madison, University of Illinois-Chicago, USDA Animal and Plant Health Inspection Service, USDA Forest Service, and U.S. Geological Survey (Lake Michigan Field Station).

Five researchers submitted information about the external funding sources and costs allocated to conduct research at INDU through permits obtained from the park. Among these, three university researchers obtained separate NSF grants worth $100,000, $240,000 and $143,556 for research on air contaminant effects on forest trees, reptile biodiversity, and diversity of ticks, respectively, in public lands of the Great Lakes Region (including INDU). Another researcher obtained $25,000 through NRPP funding to conduct contaminant research in pannes of INDU and SLBE. USGS researchers at the INDU field station also contribute about $210,000 annually toward research in the park. The monetary investment shown here represents only a portion of the economic benefit of research conducted through the RPRS system.

GLREC Initiatives in Obtaining Park-based Funding

The research coordinator was directly involved in obtaining Cooperative Conservation Initiative (CCI) funding ($15,000) for a Ph.D. graduate student at Michigan Technological University, a CESU university, to conduct pitcher plant investigations in 3 U.S. national parks and 2 Canadian national parks. The research coordinator also manages a $2,490 contract with the student to implement additional research on pitcher plant genetics at Indiana Dunes National Lakeshore. Funding for the this 2004-2005 project was from the GLREC's base funding. Results of this

project will be published in National Park Service journals and newsletters, as well as in peer-reviewed scientific journals. This project will provide information about the degree of genetic variation in pitcher plants, a keystone wetland plant, among U.S. and Canadian parks in the Lake Superior and Lake Michigan watersheds. Results will be used to determine if plants in these watersheds are genetically equivalent and can therefore be transplanted across regions for restoration purposes.

GLREC Involvement in USGS Research and Education Projects

The USGS has partnered with the GLREC to conduct research projects at several Great Lakes National Parks:

1. Purple Loosestrife Demography Research using Trained Citizen Scientists
   This project is international in scope to determine the biological factors affecting purple loosestrife invasions.
2. Role of Cattail Hybridization in its Invasiveness in Three Great Lakes National Parks
   This is a USGS Park Oriented Biological Support (POBS) funded project to determine impacts of cattail hybridization on cattail invasiveness in three national parks (INDU, SACN, and VOYA). Results will be published in 2006 in National Park Service journals and peer-reviewed scientific journals. Approximately 13% of the $171,000 grant has been appropriated for the research in 2005. This multi-park project will provide important information about the relevance of cattail management in national parks and non-park lands where cattails are a serious threat to wetland biodiversity
3. Participation in development of a Park Science publication with USGS researchers who are conducting studies of the role of enterococci bacteria in beach closures.

Research Quality and Communication

The research projects managed through RPRS are primarily those for INDU. Results from this research are published in the NPS web-based Research Annual Reports, technical reports, and in peer-reviewed journals. Research with direct GLREC involvement is summarized in public outreach newsletters, such as those published by Friends Groups, and on several internet web sites. USGS researchers produce written documents for the public as well as for peer-reviewed journal articles. Both communication methods are being applied to the current projects with direct GLREC involvement. USGS and GLREC staff also produces poster and oral presentations for National Park Service resource management meetings, as well as for other scientific conferences.

Detailed Description of Research Projects with Direct GLREC Involvement

Of the four major research projects, three are multi-park, national and international in scope, and one is being conducted at a single park (INDU):

Multi-park Projects

1. Pitcher Plant Biodiversity and Population Genetics in Four U.S. National Parks and Three Canadian National Parks in the Great Lakes Region (Figs. 2, 4).
2. Role of Cattail Hybridization in Invasions of Three National Parks in the Great Lakes Region (Figs. 3, 4).
3. Purple Loosestrife Population Characteristics at the Regional, National, and International Levels, Citizen Science Involvement (Fig. 5).

The research coordinator obtained external funding for the first two projects and co-developed several posters, park publications, and presentations to educate managers, the public, and other scientists about the management implications of invasive species. The education coordinator developed workshops including research results from these projects.

Single Park Research Projects: Indiana Dunes National Lakeshore

1. Restoration of Oak-Savanna in Disturbed Lands of Indiana Dunes National Lakeshore

The research coordinator assisted is procurement of grant funds for the project. The education coordinator has been able to develop educational materials and conduct public education such as workshops, brochures, and editorial articles based on these four projects. A teacher training workshop that has been coordinated by the GLREC staff and other partners for the past 3 years is the Wetlands in Parks Workshop (WIP), held for 2-3 days during the spring or summer annually (Figs. 6a, 6b). Oak-savanna restoration research has also resulted in workshops, public tours, high school student education, and outdoor educational signage (Fig. 7).

Figure 2. The Cooperative Conservation Initiative (CCI) Program provided funds to support a Ph.D. student conducting genetic studies of pitcher plants in four U.S. national parks and two Canadian parks.

Figure 3. USGS-NPS funding through Park Oriented Biological Support (POBS) facilitated a cooperative study on cattail hybridization at INDU, SACN, and VOYA.

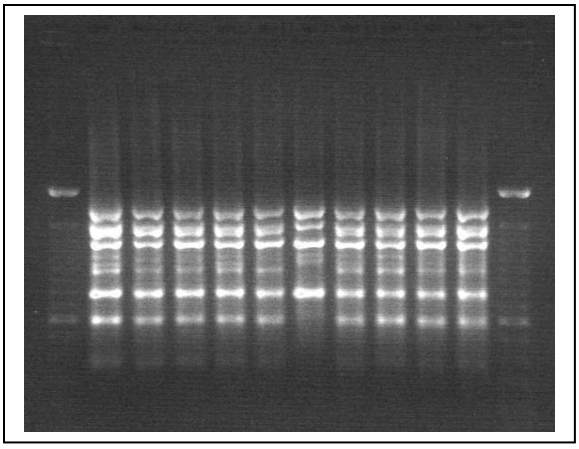

Figure 4. Both projects (Figs. 2 and 3) used modern molecular techniques to identify plant populations for management and restoration purposes.

Figure 5. GLREC staff assisted a USGS researcher in developing a citizen science monitoring program as part of an international research project on the biology and management of purple loosestrife, a highly invasive, exotic plant species in the U.S.

Figure 6a. At the annually held Wetlands in Parks Workshop (WIP) at Indiana Dunes National Lakeshore, scientists demonstrate flora and fauna found in wetlands.

Figure 6b. Teachers and informal educators learn molecular techniques to evaluate wetland biodiversity during the WIP Workshop.

Figure 7. Students learn how to monitor oak-savanna restoration as part of a Purdue University research project.

2005 Research Publications and Presentations with GLREC Involvement (activity or funding)

Publications and Abstracts:

1. Belant, J.L., J. Van Stappen, and D. Paetkau. 2005. American black bear population size and genetic diversity at Apostle Islands National Lakeshore. Ursus 16:85-92.

2. Choi, Y.D., J. Marburger, and W. Smith. 2005. Demonstration of oak-savanna restoration in Indiana Dunes National Lakeshore. Ecological Society of America-INTECOL Joint Meeting, August 7-12, Montreal, Quebec, Canada.

3. Karberg, Jennifer M. 2005. Biogeographic Distribution and Genetic Diversity of *Sarracenia purpurea* within the Western Lakes Superior Watershed. Fourth Annual Western Great Lakes Research Conference, March 30-31, Northern Michigan University, Marquette, Michigan.

4. Marburger, Joy E. 2005. Wetland Research in National Parks of the Great Lakes Region. George Wright Society Meeting, March 14-18, 2005, Philadelphia, Pennsylvania.

5. Marburger, Joy E., Steven E. Travis, and Steve K. Windels. In press. Cattail Sleuths Use Forensic Science to Better Understand Spread of an Invasive Species. Natural Resource Year in Review- 2006.

6. Smith, W., R. Whitman, and M. Nevers. In press. Advances in Recreational Water Quality Monitoring at Indiana Dunes National Lakeshore, Park Science.

7. Windels, Steve K., Steven E. Travis, and Joy E. Marburger. 2005. Assessment of cattail (*Typha* spp.) genetic status in Three Great Lakes National Parks. National Association of Lake Managers Annual meeting.

8. Windels, Steve K., Joy E. Marburger, and Daniel H. Mason. 2005. Cattail (*Typha* spp.) Invasions in Great Lakes Parks: Why Is It Happening and Can We Control It? Fourth Annual Western Great Lakes Research Conference, March 30-31, Northern Michigan University, Marquette, Michigan.

Research Information Transfer: Education and Outreach

Public Information Outlets:

1. Newspaper articles: an article featuring *E.coli* research and beach monitoring was published in local news. An article on the Inventory and Monitoring Network was published in the local newspaper at SLBE.

2. Four articles were published in the Singing Sands Almanac, the newsletter of the Friends of Indiana Dunes. Topics featured included research on cattail invasion, small mammal ecology, *E. coli* in beach contamination, slime mold surveys, and summary of the Great Lakes Invetory and Monitoring Program.

3. The GLREC and the RLC websites were maintained and updated with information about current research/education events and research results.

4. Interpretive signage and a brochure were developed to increase understanding of oak savannas and oak savanna restoration research in Indiana Dunes National Lakeshore.

Value of GLREC to Research Partners

Examples of satisfaction with the GLREC assistance in research implementation include the following statements:

1. Steve Travis, USGS Research Ecologist, USGS National Wetlands Research Center

"I am writing on behalf of Joy Marburger at the Great Lakes Research and Education Center. The proactive role that Joy has assumed in promoting research on the control of invasive species in the national parks of the Great Lakes Region has led me to broaden my own research program to include studies of invasive cattails. Joy has given freely of her time in first alerting me to the need for genetics in confirming the role of hybridization in the invasiveness of cattails, second in writing a proposal to get this research funded, and third in actually carrying out this research. In addition, Joy has been active in helping me to explore additional funding opportunities for research in the Great Lakes region, not only on invasives, but on trust species as well. In short, Joy Marburger and her center have been great resources for me in strengthening my awareness of resource challenges facing the Great Lakes region and in seeking the funding to address them."

Steve Travis, Ph.D.
Ecologist (Genetics)
USGS National Wetlands Research Center
700 Cajundome Boulevard
Lafayette, LA 70506
Phone: 337-266-8583

1. Sheila Lyons-Sobaski, Professor

"The Great Lakes Research and Education Center has made it possible for me to access important sites of *Sabatia angularis* , Gentianaceae, which is a state-threatened plant in Michigan. Given the Indiana Dunes National Park's close proximity to Michigan, and that few populations occur in northern Indiana, I hypothesize that the populations in the pannes are genetically very important. Without Joy's help, I would not have known where to find the species at the dunes. In addition, her assistance taught me a great deal about dune ecology!"

Sheila Lyons-Sobaski, Ph.D.
Biology Department
Albion College
611 East Porter Street
Albion, MI 49224
Phone: 517/629-0649
Fax: 517/629-0888
ssobaski@albion.edu

2. Pamella Geddes, Ph.D., Post-doctoral Student

"As a post-doctoral research associate working at Loyola University of Chicago, I had the opportunity to interact with the scientists and staff at Great Lakes Research and Education Center (GLERC) to prepare a proposal for future research to be conducted at Indiana Dunes. Not only did they (specifically Dr. Marburger) provide assistance finding field sites and offering laboratory facilities, but they also suggested excellent ways in which results from the proposed research could be disseminated to wide audiences in coordination with the Education Coordinator at GLERC. If funded, the proposed research at Indiana Dunes and GLERC in particular, will definitely provide valuable data on the effect of invasive species in ecosystems, a topic of utmost concern for both basic ecology and applied conservation biology. The opportunities GLERC provides regarding the facilitation of research are outstanding and, as such, GLERC and its staff should be recognized and valued for their role in the advancement of science."

Pamela Geddes, Ph.D.
Dept. of Biology
Loyola University Chicago
6525 N. Sheridan Rd.
Chicago, IL 60626

3. Beth Middleton, USGS Research Ecologist, National Wetlands Research Center

"The GLREC of the National Park Service has contributed to my worldwide research program on the growth patterns and distribution of purple loosestrife, a widespread invasive species of North America native to Eurasia. GLREC, in conjunction, with USGS trained 25 volunteers in a workshop in Spooner, Wisconsin and GLREC also recruited 3 volunteers in Indiana. The volunteer network grows through volunteers talking to others about the program. The volunteers make possible the logistically difficult task of collecting worldwide data on a widespread species in both its invasive and native habitats. At the same time, the program educates the public in the environmental problems posed by invasive species, and gives them an appreciation for the importance of research by participating in the work."

Value of GLREC to Education and Outreach Partners

1. Cristina Bonilla-Warford, Notebaert Nature Museum

"For the last 2 years, the Notebaert Nature Museum has worked with Wendy Smith and Joy Marburger from the Great Lakes Research and Education Center to develop and facilitate 2 teacher workshops about Midwestern wetlands. Course content included wetland characteristics, current research, field experiences, and curricular connections. Working with Mrs. Smith was wonderful; connections to researchers and access to the Indiana Dunes National Lakeshore was invaluable. The GLREC helped the teachers (and our Museum staff) make connections to current, real-world issues in science. The expertise, experience, and professionalism of the GLREC staff, as well as their willingness to share with us, made them one of the best collaborating partners we've worked with. We are looking forward to working with them on future projects, as well."

Cristina Bonilla-Warford
Assistant Manager of Student & Teacher Programs
The Notebaert Nature Museum
2430 North Cannon Drive
Chicago, Illinois 60614
Ph. 773-755-5165
naturemuseum.org

2. Save the Dunes Conservation Fund

"The Great Lakes Research and Education Center has provided valuable research information for our Indiana Coastal Restoration Action Team project. Staff members at the center are always willing to partner with our staff on projects. Their input toward the Northwest Indiana Invasive Plant Network has been of benefit to us as participants."

Carol Cook, Project Coordinator
Save the Dunes Conservation Fund
444 Barker Road
Michigan City, IN 46360
phone 219-879-3564

3. Steve Yancho, Sleeping Bear Dunes National Lakeshore

"The staff at the GLREC has provided SLBE with support in pulling together a workshop on how to establish a Cooperative Weed Management Area, with focus on control of the invasive plants in Northwest Lower Michigan. This workshop was jointly sponsored by the National Park Service and the U.S. Forest Service (Huron-Manistee National Forest - HMNF), and was an outgrowth of the Midwest Resource Group effort to establish an Early Detection/Rapid Response (EDRR) project in this area. The EDRR project

chosen by SLBE and HMNF was the control of garlic mustard. GLREC staff provided time and expertise in organizing the workshop, and assisted through administration of the conference itself."

Steve Yancho
Chief of Natural Resources
Sleeping Bear Dunes National Lakeshore
9922 Front St.
Empire, MI 49630
Ph: 231-326-5134 ext. 421

4. Stephanie Smith, Alliance for the Great Lakes

"The Great Lakes Research and Education Center is doing much-needed work to bridge a gap between research and education that has existed in the Great Lakes region. They have proven a fantastic partner in bringing Great Lakes research to educators and translating it into a useful and teacher-friendly language so it can be used for educational purposes. In particular, Education Coordinator, Wendy Smith has conveyed compelling and important information on beach closings and E. coli as a questionable indicator species through articles and presentations to educators that provided an essential and more complete picture of the issue. Joy Marburger provided information on wetlands for the education programs. The Alliance for the Great Lakes looks forward to continuing our relationship with the GLREC."

Stephanie Smith
Education Program Manager
Alliance for the Great Lakes
220 State Street, Suite 1900
Chicago, IL 60604
Ph. 312-939-2708
Email ssmith@greatlakes.org

Table 6. Communicating Research Results (P=public, T=teachers/students, M=managers, S=scientists)

Type of Product	Category (P, T, M, S)	Program Objective(s)	No. Scientists Involved	Type Recipients	No. Recipients	Event Length (hrs)	Total Contact Hrs
Invasive Species Survey-Purple Loosestrife	P, M, T	Citizen Science Survey	4	local adults	12	2	24
Workshop Wetlands in Parks	P, M, T	Wetland Research Information and Education	3	local adults, middle, high school teachers, interpreters	20	30	600
George Wright Society Poster	P, T, M, S	Wetlands in Great Lakes Parks	1	scientists, managers	500	8	4,000
George Wright Societiy Oral Presenation	P, T, M, S	GLREC: Accomplishments	At least 50	public, teachers, managers, scientists	100	1	100
National SWS Wetlands Meeting Oral Presentation	P, M, S	Recruitment of Scientists	6	managers, college students	6	4	24
Research Meeting	M, S	Develop Research Consortium (Purdue University, USGS, IDEM, NIPRC)	8	scientists, managers, university graduate students	8	3	24
Public Forum	P, M	Invasive cattail information	1	public, managers	15	2	30
Loyola University Forum	T, S	Invasive cattail information	3	university students, faculty	50	2	100

GLREC Tours	M, S	Tour of GLREC Research Station	10	scientists	12	1	12
Workshop	T	Fish Contaminants	1	teachers	15	6	90
Workshop	M	Cooperative Weed Management Areas	1	NPS, USFS, & partner land managers	40	6	240
Workshop	M	Garlic Mustard Control	1	NPS, US Forest Service, & partner land managers	35	4	140
Public presentation	T, P	Oak Savanna Restoration Research Demonstration (3x)	1	Public high school and university students	130	1	130
Workshop	T	Great Lakes Institute and Great Lakes Teacher Workshops (2x)	6	High school and middle school teachers	35	30	1,050
Workshop	Oak Savanna Restoration Research	Teacher Training	1	High school and middle school teachers	10	5	50
Staff Training	M	Research Updates (2x)	4	INDU interpretive staff	10	4	40
Brochure	P	Oak Savanna Restoration Research	1	Hikers, program participants	Approx 300	N/A	N/A
Site Bulletin	P, M	Beach Health Information	2	General public, managers	Approx 200	N/A	N/A
Booth	P	Inform and Involve Public in Mollusk Monitoring	2	Public, & middle school students	60	0.25	15
Workshop	T	Exploring Wetlands (2x)	3	Middle and high school teachers	12	12	144

IV. STATISTICS FOR THE COMPLETED YEAR 2004-2005

Of the two multi-park research projects facilitated by the GLREC with external funding for 2003-2005, results are near completion for "The Role of Cattail Hybridization in Cattail Invasions of Fresh Water Wetlands in Great Lakes National Parks." The results of this project, funded through the USGS-NPS POBS program, will be published in a peer-reviewed journal and presented at a national meeting during 2006. The results will be used to educate managers and interpreters on the need to control cattails in National Parks and elsewhere, since they are hybrids between the native and exotic cattail species that threaten wetland biodiversity.

There were 28 RPRS and park external funded projects that provided cross-boundary (parks and outside park boundary) information transfer. The remaining 16 projects involved INDU only.

The number of visitors that had their experience enhanced through GLREC programs is estimated at 1,658, including visitors having direct contact with researchers, GLREC staff, or GLREC projects. It is difficult to estimate the number of people benefiting from the newspaper and newsletter articles written, the brochures created, or interpretive signs installed.

V. IMPACTS TO ACCOMPLISHMENTS

Appropriations for the CCI and NRPP Resource Management projects were reduced substantially for 2006-2009. The research coordinator developed and submitted two research proposals for this period, but unfortunately funding was no longer available for any projects in this category. One was developed in cooperation with the University of Wisconsin as a follow-up study of the variations in ecologic responses of cattail populations in the three National Parks where the USGS research was conducted. This information would have been used to develop better management practices for cattail control.

Due to a fixed annual budget with rising operating costs, funding to support research must be obtained from outside sources. Several Parks as Classrooms proposals were submitted by GLREC staff, but were not funded due to declining budgets.

Travel cutbacks have made it difficult for GLREC staff to conduct research and outreach activities at partner parks in the Great Lakes Network, and have also greatly reduced the number of conference networking opportunities that have successfully generated research and education partnerships in the past.

VI. PLANNING FOR FUTURE PROGRAM DEVELOPMENT

Some of the planned activities will depend on available funding. Future programs development will be to:

- seek external funding sources and partnerships to continue and expand research and education opportunities
- facilitate rigorous scientific approaches to park science to improve resource management
- enhance closer relationship with researchers through monitoring of permits; require all permit applicants to include an educational/outreach component with their research objectives
- develop scientific consortia with universities and other government entities to enhance information sharing among researchers and managers
- develop training opportunities for resource managers that enhance resource management
- continue development of GLREC research facilities to encourage more research in Great Lakes network national parks; develop training programs using the laboratory facility
- promote high quality citizen science training to the public and university students alike to assist researchers in data collection
- improve data and information technology accessibility among the network parks and Natural Resource Challenge programs
- develop additional avenues to inform NPS staff, partners, and public entities of research results, including a weekly feature on e-mail, monthly newspaper articles, magazine articles, and television segments.

APPENDIX 1.

Projects Requiring Permits For
Indiana Dunes National Lakeshore

Direct GLREC Involvement		2004-2005 RPRS Permits submitted and approved at Indiana Dunes National Lakeshore
Yes	1	Title: Long-term comparison of the demography and genetics of natural and restored populations of Cirsium pitcheri: Can we create and maintain viable plant populations? App Number: 24514
Yes	2	Part I) Integrating long-term demographic data and repeated genetic sampling for viability analysis of natural and restored Cirsium pitcheri populations. (NEW) Part II) App Number: 21184
Yes	3	The Role of Belowground Plant-Microbe Interactions in Plant Invasions App Number: 17102
Yes	4	The effects of oak woodland structure on bird, butterfly, amphibian, reptile, and herbaceous vegetation assemblages App Number: 8193
Yes	5	Survey and ranking of non-indigenous invasive plants in four national lakeshores along the upper Great Lakes App Number: 24025
Yes	6	Study of Rare and Endangered Mammals in Northern Lake, Porter, and La Porte Counties of Indiana App Number: 24803
Yes	7	Study in comparison of eolian deposits in marine and fresh water conditions. Grain size, composition analysis. App Number: 21863
Yes	8	Studies of Eumycetozoan Biodiversity (Slime molds) App Number: 24795
Yes	9	Spatial and Temporal Effects of Climate Change on Great Lakes Wetlands App Number: 25303
Yes	10	Shrubs and Woody Vines of Indiana App Number: 7617
Yes	11	Shrubs and Woody Vines of Indiana

		App Number: 24318
Yes	12	Range expansion and determination of the extent of penetration of round and tubenose gobies into connecting waterbodies and impacts on co-inhabiting native species App Number: 9411
Yes	13	Population genetics of Sabatia angularis (Gentianaceae) in the Upper Midwest App Number: 24643
Yes	14	Persistance and dispersal patterns of Galerucella sp. at Long Lake, Indiana Dunes National Lakeshore App Number: 21382
Yes	15	Part I) Integrating long-term demographic data and repeated genetic sampling for viability analysis of natural and restored Cirsium pitcheri populations. Part II) Recovery plan App Number: 21086
Yes	16	Occurrence and transport of enteric viruses and water quality indicators. App Number: 20909
Yes	17	Northern Indiana Public Service Company (NIPSCO), Bailly Generating Station, RCRA Facility Investigation App Number: 24319
Yes	18	Mycorrhizal regulation of ecosystem response to chronic nitrogen deposition App Number: 8698 App Number: 25469 App Number: 25469
Yes	19	Monitoring Avian Migrations, Productivity, and Survivorship in Miller Woods App Number: 19422
Yes	20	Molecular systematics of North American reed beetles (Coleoptera: Chrysomelidae, Donaciinae) App Number: 24720
Yes	21	Mesocosm and field studies will be conducted to determine the levels of heavy metals and nitrogen in pannes, their spatial distribution within a panne, and susceptibility of panne vegetation to invasive species App Number: 18262 App Number: 23051
Yes	22	MAPPING THE VEGETATION AND FUELS OF THE INDIANA DUNES NATIONAL LAKESHORE App Number: 24391
Yes	23	Kankakee Sands Efroymson Restoration Project (KSER)

App Number: 15747 App Number: 20155

Yes 24 Indiana Dunes National Lakeshore Herbarium
App Number: 7160 App Number: 24424

Yes 25 Impact of Air Pollution on the Fungi of Indiana Dunes National Lakeshore
App Number: 21271

Yes 26 Illinois Butterfly Monitoring Network Field Workshop
App Number: 24418

Yes 27 Gypsy Moth Survey
App Number: 18703

Yes 28 Great Lakes Glacial History and Species Variation: A Multiscale Comparative Analysis
App Number: 17164

Yes 29 Genetic diversity of Sarracenia purpurea: Restoration within Indiana Dunes National Lakeshore
App Number: 24194

Yes 30 Experimental restoration of oak-savanna in the Indiana Dunes National Lakeshore
App Number: 16263

Yes 31 Exotic Beetle Survey
App Number: 18580 App Number: 22220

Yes 32 Examination of population characteristics of two state-listed (Indiana) Carex species within the pannes of the West Beach Unit of the Indiana Dunes National Lakeshore.
App Number: 20600

Yes 33 Emerald Ash Borer survey
App Number: 24472

Yes 34 Wild lupine seed collection.
App Number: 24566

Yes 35 Study of Rare and Endangered Mammals in Northern Lake, Porter, and La Porte Counties of Indiana

		App Number: 24803
Yes	36	Molecular systematics of North American reed beetles (Coleoptera: Chrysomelidae, Donaciinae) App Number: 24720
Yes	37	ECOLOGICAL IMPACTS OF REMEDIATION AT THE GRAND CALUMET RIVER SUPERFUND SITE: A PRELIMINARY ASSESSMENT OF THE EFFECTS ON REPRODUCTIVE SUCCESS OF GREAT BLUE HERONS App Number: 23322
Yes	38	Assessing the Potential Homogenization of the Vegetation of the Western Great Lakes Coastal Dunes App Number: 24495
Yes	39	A Survey of submerged aquatic plants and associated invertebrates App Number: 24129
Yes	40	Frog call movies App Number: 20148
Yes	41	Effects of hybridization on herbivore resistance traits and implications for polyploid speciation in sunflowers App Number: 21454
Yes	42	Effects of Fire Frequency on the Understory Species Richness of a Fire Suppressed Silt Loam Savanna Complex App Number: 21387
Yes	43	Development of the Great Lakes Natural Resource Gateway App Number: 17474
Yes	44	Dunes Creek Watershed Management Plan App Number: 20951